Permit Application
for
Lower Howards Creek
Sanitary Sewer Improvements
Hampton/Vaught Permit
Winchester, Clark County, Kentucky

Palmer Engineering Company, Inc.

JACKSON ENVIRONMENTAL PROJECT NO. 10-005-101-07

May 27, 2009

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Lower Howards Creek
Sanitary Sewer Improvements
Hampton/Vaught Permit
Winchester, Clark County, Kentucky

Prepared For:

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May 27, 2009

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1.0 INTRODUCTION

Jackson Environmental Consulting Services, LLC, (Jackson Environmental) of Richmond, Kentucky was contracted by Palmer Engineering Company, Inc., of Winchester, Kentucky to identify the extent of all potential Section 404 issues, *i.e.*, jurisdictional waters including wetlands and "other waters" of the U.S. for the Lower Howard Creek Sanitary Sewer Improvements in Winchester, Clark County, Kentucky (project area). The general project corridor consists of right-of-way, existing easements, proposed construction (temporary) easements, and proposed permanent easements. Proposed permanent easements extend 10 feet (ft) off both sides of the centerline of the proposed sewer alignment and are acquired for the entire length of the sewer. Construction easement is typically acquired 15 ft outside both sides of the permanent easement yielding a fifty foot easement for construction when construction and permanent easement are combined. In many locations throughout the project corridor where the proposed sewer parallels Lower Howard's Creek, construction easements are only acquired on the uphill side (away from the stream) of the sewer line to limit the area of disturbance in close proximity to the stream. In areas where no construction easement is acquired on the side of the sewer closest to Lower Howard's Creek, the construction easement is extended 35 ft outside of the uphill permanent easement. Proposed permanent and construction easements coincide with existing easements and right-of-way throughout the corridor. Existing right-of-way, existing easement, proposed permanent easement, and proposed construction easement make up the project corridor and establish limits of disturbance for construction. The project area is mapped on the United States Geological Survey (USGS) Austerlitz and Winchester quadrangles, 7.5-minute series, topographic map. The northern terminus of the project area is located at Universal Transverse Mercatur (UTM) coordinates E0746371, N4207980 North American Datum 1983 (NAD 83), Zone 17 the project area runs southwest to its southern terminus(UTM) coordinates E0746084, N4206844 then runs northeast to its eastern terminus at (UTM) coordinates E0746698, N4206853 (Attachment 1).

1.1. Project Purpose

The project area was surveyed to identify the extent of all potential jurisdictional waters of the United States (jurisdictional waters), which include navigable waters, associated tributaries, and adjacent wetlands. Jurisdictional waters are subject to the provisions of Section 404 of the Clean Water Act (33 CFR 328) and Section 10 of the River and Harbors Act of 1899. Data provided in this document is based upon the opinion of Jackson Environmental. The United States Army Corps of Engineers (USACE) will have the final determination of the extent of jurisdictional waters.

2.0 METHODS

2.1 Wetland Delineation

Jackson Environmental conducted a level 3, routine wetland delineation as described in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guide Book, May 2007*. Field investigations for the wetland delineation were completed on 28 and 29 July 2008.

Low-lying areas within the project area appearing to have the greatest potential for USACE regulation under Section 404 were selected and evaluated for the presence of hydrology, hydric soils, and hydrophytic vegetation. Sampling point location maps are provided in Attachment 2.

Jones, *Plant Life of Kentucky* (2005) and Strausbaugh and Core, *Flora of West Virginia* (1978) was used to confirm certain plant identifications. The U.S. Fish and Wildlife Service, *National list of Vascular Plant Species that Occur in Wetlands: 1996 National Summary* was used to determine wetland indicator status for the dominant species. Natural Resource Conservation Service's (NRCS) online soil survey data from Clark County (2002) was used to determine the Soil Conservation Service's (SCS) map units for the project area. The NRCS *Hydric Soils List and Map Units With Hydric Inclusions* in Clark County, Kentucky were also used to evaluate the potential for the occurrence of hydric soils within the project area.

Weather conditions (*i.e.*, rain, humidity, and temperature), which potentially affect hydrologic indicators were recorded utilizing Weather Underground, Inc., (www.wunderground.com) during and three days prior to the date of the delineation.

Table 1.   Weather conditions for dates of the delineation as well as three days prior

Date	Precipitation (in)	Temperature		Humidity	
		High (°F)	Low (°F)	High (%)	Low (%)
25 July 2008	0.00	86	67	92	42
26 July 2008	0.00	92	66	100	44
27 July 2008	0.00	93	67	100	29
28 July 2008	**0.00**	**83**	**67**	**91**	**51**
29 July 2008	**0.00**	**90**	**70**	**91**	**41**

Note: Days of the delineation are indicated in bold.

2.2   Other Waters

2.2.1   Stream Delineations

The project area was surveyed on 28 July 2008 and 29 July 2008 to identify the extent of potential "other waters" of the U.S. Jurisdictional extent was determined by the presence and/or absence of an Ordinary High Water Mark (OHWM) with a defined bed and bank, measured in linear feet and acres.

All streams within the project area were evaluated and were identified. Due to the narrow width of the project area, streams were not delineated in their entirety. Only the portions of streams within the project area were evaluated.

2.2.2   Perennial/Intermittent/Ephemeral Conversion Zones

Ephemeral/Intermittent conversion zones were determined in accordance with the recommended protocol of the USACE *"Guidance for Delineation of Ephemeral/Intermittent Streams for Purposes of the Memorandum Opinion and Order of October 20, 1999."* The definitions for the stream type, provided by this protocol state:

Perennial conversion zones were based solely upon the USACE definition of perennial streams: "[The stream] has flowing water year-round during a typical year, has its primary source for stream flow from groundwater, the water table is located above the streambed for most of the year, and runoff from rainfall is a supplemental source of water for stream flow."

"An intermittent stream is a stream that has flowing water during certain times of the year when groundwater provides water for stream flow. Runoff after periods of

precipitation gives only a supplemental source of water for stream flow. Intermittent streams may not have stream flow during dry periods."

"An ephemeral stream is a stream that has flowing water only during and for a short time after a precipitation event in a typical year, using runoff as a primary source of water for stream flow. Streambed for ephemeral streams are located above the water table and do not have groundwater as a source."

2.2.3 Habitat Assessments

Habitat suitability of each stream was assessed and rated on 10 parameters in three categories using a modified version of the EPA *Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers*. These parameters are listed and explained on the project field data sheets provided in Attachment 12. Each site was ranked according to its habitat score and classified by one of four levels of suitability.

Optimal	Classification range of 166-200; implies habitat has the structure and stability of substrate necessary to sustain a viable benthic macroinvertebrate population
Suboptimal	Classification range of 113-165; implies habitat has 40% to 70% of the necessary structure and stability of substrate to sustain a viable benthic macroinvertebrate population
Marginal	Classification range of 61-112; implies habitat has 20% to 40% of the necessary structure and stability of substrate to sustain a viable benthic macroinvertebrate population
Poor	Classification range of 0-60; implies habitat has 0% to 20% of the necessary structure and stability of substrate to sustain a viable benthic macroinvertebrate population

3.0 FINDINGS AND RESULTS

3.1 General Project Area Description

The project area is generally characterized as a mixture of residential and commercial properties and associated supporting infrastructure. Topography in the project area is characterized as generally flat to gently sloping. A perennial tributary, *i.e.*, Lower Howard Creek (LHC) bisects the project area (Attachments 1). Elevation in the project area ranges between approximately 919 ft and 984 ft above sea level.

3.2 Current Land Use

The land use within and surrounding the project area is primarily urbanized, including residential and commercial properties, with small fragmented forests associated with the riparian zones along the eastern branch of Lower Howard's Creek. Additional land use includes water drainage, transmission lines (ROW), and roads. Representative photos are provided in Attachment 7.

Topography in the project area is characterized as generally flat to gently sloping. A perennial tributary, Lower Howard Creek bisects the project area (Attachment 1). Elevation in the project area ranges from approximately 919 ft to 984 ft above sea level.

3.3 Wetlands

A total of five sampling points were established in three areas, and data was collected on the vegetation, hydrology, and soils at each of these locations. Five sampling points located in three areas (Wetland No. 1-2) totaling 0.649 ac were identified as potential Section 404 wetlands within the project area. These areas included Wetland No. 1 (0.476 ac), and 2 (0.173 ac), located in headwater tributaries of Lower Howard's Creek. Both wetlands met all criteria set forth by the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987). Completed Corps data forms for all sampling locations are provided in Attachment 11. Representative photos of each wetland are provided in Attachments 8 and 9. The following table provides a summary of findings at each of the four sampling locations.

Table 2. Jurisdictional and non-jurisdictional wetlands within area of delineation.

Wetland ID	Potential Jurisdictional Wetland	Associated Stream	WAS Upland Points	WAS Wetland Points	Wetland Area (acre)
1	Yes	LHC	5	4	0.476
2	Yes	LHC	3	2	0.173
N/A	No	LHC	--	1	0.000

3.3.1 Vegetation

The project area currently supports plant communities characteristic of small fragmented wetlands in an urbanized setting along Lower Howard's Creek. Species in this urbanized plant community include various grasses, such as fescue (*Festuca rubra*), iron weed (*vernoia* spp.), Johnson grass (*Sorghum halepense*) milk week (*Asclepias virdidis*), winter creeper (*Euonymus fortunei*), and wood nettle (*Laportea canadensis*).

Hydrophytic vegetation was observed at two of the three wetland sampling sites (Table 2) (Attachment 11). These areas are dominated by herbaceous species, including box elder (*Acer negundo*), black willow (*Salix nigra*), common rush (*Juncus effusus*), curly dock (*Rumex crispus*), green ash (*Fraxinus pennsylvanica*), and various sedges (*Carex spp.*).

3.3.2 Wetland Hydrology

Wetland No. 1 receives water from upland runoff and precipitation as well as seasonal flooding of the east branch of Lower Howard's Creek (EBLHC). This wetland subsequently drains back into Lower Howard's Creek.

Wetland No. 2 receives water from upland agricultural runoff via a drainage corridor as well as from seasonal flood events of the EBLHC. This wetland subsequently drains back into (EBLHC).

Positive indicators of wetland hydrology were observed at two of the three sampling sites (Table 2).

3.3.3 Soils Characterization

The NRCS soil survey for Clark County maps 13 soil series within the project area (Attachment 3). Three series (Linside, Melvin, and Newark), are listed as hydric by SCS and NRCS, when occurring within the floodplain. The soil series present in the project area include the Ashton series (AsB map unit), Ashwood series (AvD3 and AwD map units), Braxton series (BoB and BoC2 map units), Hampshire series (HmB, HmB2,

HmC, HmC2, HmD2, and HpC3 map units), Huntington series (Hs map unit), Lindside series (Ld map unit), Loradale series (LeB, LeC, and LeC2 map units), Maury series (MbB, MbC, and MbC2 map units), McAfee series (McB, McC, MfC2, MfD2, and MhE2 map units), Mercer series (MmB map unit), Melvin series (Ml map unit), Newark series (Ne map unit), and Salvisa series (SaD3, ScB2, ScC2, ScD2, and ScE2 map units). Positive indicators of hydric soils were observed at seven of the 14 sampling sites (Table 2) (Attachment 2).

The Ashton series consists of very deep, well drained soils that formed in loamy alluvium on low stream terraces and alluvial fans. Permeability is moderate. Slopes range from 0 to 15 percent.

The Ashwood series consists of moderately deep, well drained soils on uplands in residuum weathered from phosphatic limestone. Slopes range from 2 to 70 percent.

The Braxton series consists of very deep, well drained soils on undulating to hilly uplands and high terraces formed in old clayey alluvium or valley fill and residuum weathered from limestone. Permeability is moderately slow. Slopes range from 2 to 50 percent.

The Hampshire series consists of deep, well drained soils on uplands formed in clayey residuum of interbedded limestone and shale and the underlying residuum of interbedded siltstone, fine grained sandstone, shale, and limestone. Permeability is moderately slow. Slopes range from 2 to 30 percent.

The Huntington series consists of very deep, well-drained soil in alluviums on flood plains. Permeability is moderate. Slopes range from 0 to 15 percent.

The Lindside series consists of deep, moderately well drained soils formed in alluvium washed mainly from lime influenced soils on uplands and nearly level flood plains. Permeability is medium. Slopes range from 0 to 3 percent.

The Loradale series consists of deep, well drained soils formed in old alluvium residuum from limestone and thin layers of calcareous shale. Permeability is moderately slow. Slopes range from 0 to 12 percent.

The Maury series consists of deep, well-drained soils formed in silty material and weathered limestone, or old alluvium in upland areas. Permeability is moderate. Slopes range from 0 to 20 percent.

The McAfee series consists of moderately deep, well-drained soils formed in residuum weathered from limestone on upland ridge tops and side slopes. Permeability is moderately slow. Slopes range from 2 to 50 percent.

The Melvin series consists of very deep, poorly drained soils formed in silty alluvium on flood plains and in upland depressions. Permeability is moderate. Slopes range from 0 to 2 percent.

The Mercer series consists of deep, moderately, well drained soils formed partly in loess and partly in clayey residuum from phosphatic limestones. Permeability is slow. Slopes range from 0 to 12 percent.

The Newark series consists of very deep, somewhat poorly drained soils formed in mixed alluvium from limestone, shale, siltstone, sandstone, and loess on nearly level flood plains and in depressions. Permeability is moderate. Slopes range from 0 to 3 percent.

The Salvisa series consists of moderately deep, well drained soils formed in residuum from limestone or interbedded limestone and shale. Permeability is moderately slow. Slopes range from 2 to 30 percent.

3.4   FEMA 100-Year Floodplain Issues

The project area is 6,828 ft in length of which, approximately 1,100 ft is not located within the mapped FEMA 100-year floodplain (Attachment 5).

3.5   STREAM CROSSINGS

The USGS Winchester Quadrangle (7.5-minute series) topographic map indicates that Lower Howard's Creek flows through the project area and has four unnamed tributaries and one swale within the project area. Field investigation confirmed the presence and designation of Lower Howard's Creek and documented the presence of five unnamed tributaries of Lower Howard's Creek (UT-A, UT-B, UT-C, UT-D, and UT-E) and one swale (Swale 1) within the project area. (Attachment 2). The project area intersects Lower Howard's Creek at nine locations (SC-01, SC-02, SC-04, SC-05, SC-06, SC-07, SC-08, SC-11, and SC-12) and intersect UT-A at two locations (SC-09 and SC-10). Additionally, the project area intersects both Lower Howard's Creek and UT-E near its confluence (SC-03). Representative photographs are provided in Attachment 10 for stream crossings 1-12. The UTM coordinates for each of the twelve stream crossings are included in table 3.

3.5.1 Stream Crossing 01 (SC-01)

Stream Crossing 01 (SC-01) is located in Lower Howard's Creek a perennial stream. The potential impacts of SC-01 are 7.72 ft (0.00114 ac). The stream quality is rated as Marginal with a score of 111.

3.5.2 Stream Crossing 02 (SC-02)

Stream Crossing 02 (SC-02) is located in Lower Howard's Creek a perennial stream. The proposed impacts of SC-02 are 6.99 ft (0.00044 ac). The stream quality is rated as Marginal with a score of 108.

3.5.3 Stream Crossing 03 (SC-03)

Stream Crossing 03 (SC-03) is located in at the confluence of Unnamed Tributary E (UT-E) and Lower Howard's Creek. The proposed impacts of SC-03 and Lower Howard's Creek combined are 6.00 ft (0.00077 ac). The stream quality was rated as Poor with a score of 52.

3.5.4 Stream Crossing 04 (SC-04)

Stream Crossing 04 (SC-04) is located in Lower Howard's Creek a perennial stream. The proposed impacts of SC-04 are 6.18 ft (0.00087 ac). The stream quality was rated as Marginal with a score of 77.

3.5.5 Stream Crossing 05 (SC-05)

Stream Crossing 05 (SC-05) is located in Lower Howard's Creek a perennial stream. The proposed impacts of SC-05 are 7.14 ft (0.00104 ac). The stream quality was rated as Marginal with a score of 94.

3.5.6 Stream Crossing 06 (SC-06)

Stream Crossing 06 (SC-06) is located in Lower Howard's Creek a perennial stream. The proposed impacts of SC-06 are 7.91 ft (0.00124 ac). The stream quality was rated as Poor with a score of 59.

3.5.7 Stream Crossing 07 (SC-07)

Stream Crossing 07 (SC-07) is located in Lower Howard's Creek a perennial stream. The proposed impacts of SC-07 are 6.22 ft (0.00086 ac). The stream quality was rated as Marginal with a score of 87.

3.5.8 Stream Crossing 08 (SC-08)

Stream Crossing 08 (SC-08) is located in Lower Howard's Creek a perennial stream. The proposed impacts of SC-08 are 5.30 ft (0.00161 ac). The stream quality was rated as Marginal with a score of 103.

3.5.9 Stream Crossing 09 (SC-09)

Stream Crossing 09 (SC-09) is located in Unnamed Tributary A (UT-A) a perennial tributary of Lower Howard's Creek. The proposed impacts of SC-09 are 9.85 ft (0.00111 ac). The stream quality was rated as Suboptimal with a score of 144.

3.5.10 Stream Crossing 10 (SC-10)

Stream Crossing 10 (SC-10) is located in Unnamed Tributary A (UT-A) a perennial tributary of Lower Howard's Creek. The proposed impacts of SC-10 are 5.18 ft (0.00033 ac). The stream quality was rated as Suboptimal with a score of 144.

3.5.11 Stream Crossing 11 (SC-11)

Stream Crossing 11 (SC-11) is located in Lower Howard's Creek a perennial stream. The proposed impacts of SC-11 are 25.72 ft (0.00443 ac). The stream quality was rated as Marginal with a score of 88.

3.5.12 Stream Crossing 12 (SC-12)

Stream Crossing 12 (SC-12) is located in Lower Howard's Creek a perennial stream. The proposed impacts of SC-12 are 5.88 ft (0.00088 ac). The stream quality was rated as Marginal with a score of 88.

Table 3. Potential Impacts to Streams.

Name	Stream Quality (EPA RBA)	Date	Length and Acres of Impacts				Latitude and Longitude
			Ephemeral Ft (ac)	Intermittent Ft (ac)	Perennial Ft (ac)	Total Ft (ac)	
SC-01	111	7/29/2008	--	--	7.72 (0.00114)	7.72 (0.00114)	16 S 0746005 4206771
SC-02	108	7/29/2008	--	--	6.99 (0.00044)	6.99 (0.00044)	16 S 0746177 4207381
SC-03	52	7/29/2008	--	--	6.00 (0.00077)	6.00 (0.00077)	16 S 0746185 4207415
SC-04	77	7/29/2008	--	6.18 (0.00087)	--	6.18 (0.00087)	16 S 0746242 4207534
SC-05	94	7/29/2008	--	7.14 (0.00104)	--	7.14 (0.00104)	16 S 0746262 4207606
SC-06	59	7/29/2008	--	7.91 (0.00124)	--	7.91 (0.00124)	16 S 0746329 4207794
SC-07	87	7/29/2008	--	6.22 (0.00086)	--	6.22 (0.00086)	16 S 0746348 4207916
SC-08	103	7/29/2008	--	--	5.30 (0.00161)	5.30 (0.00161)	16 S 0746246 4206801
SC-09	144	7/29/2008	--	9.85 (0.00111)	--	9.85 (0.00111)	16 S 0746568 4206936

| Name | Stream Quality (EPA RBA) | Date | Length and Acres of Impacts | | | | Starting Latitude and Longitude |
			Ephemeral Ft (ac)	Intermittent Ft (ac)	Perennial Ft (ac)	Total Ft (ac)	
SC-10	144	7/29/2008	--	5.18 (0.00033)	--	5.18 (0.00033)	16 S 0746568 4206936
SC-11	88	7/29/2008	--	25.72 (0.00443)	--	25.72 (0.00443)	16 S 0746624 4206886
SC-12	88	7/29/2008	--	5.88 (0.00088)	--	5.88 (0.00088)	16 S 0746624 4206886
TOTAL			--	74.08 (0.01076)	26.01 (0.00396)	100.09 (0.01472)	

Note: All impacts are temporary, there are no permanent impacts to streams in the area.
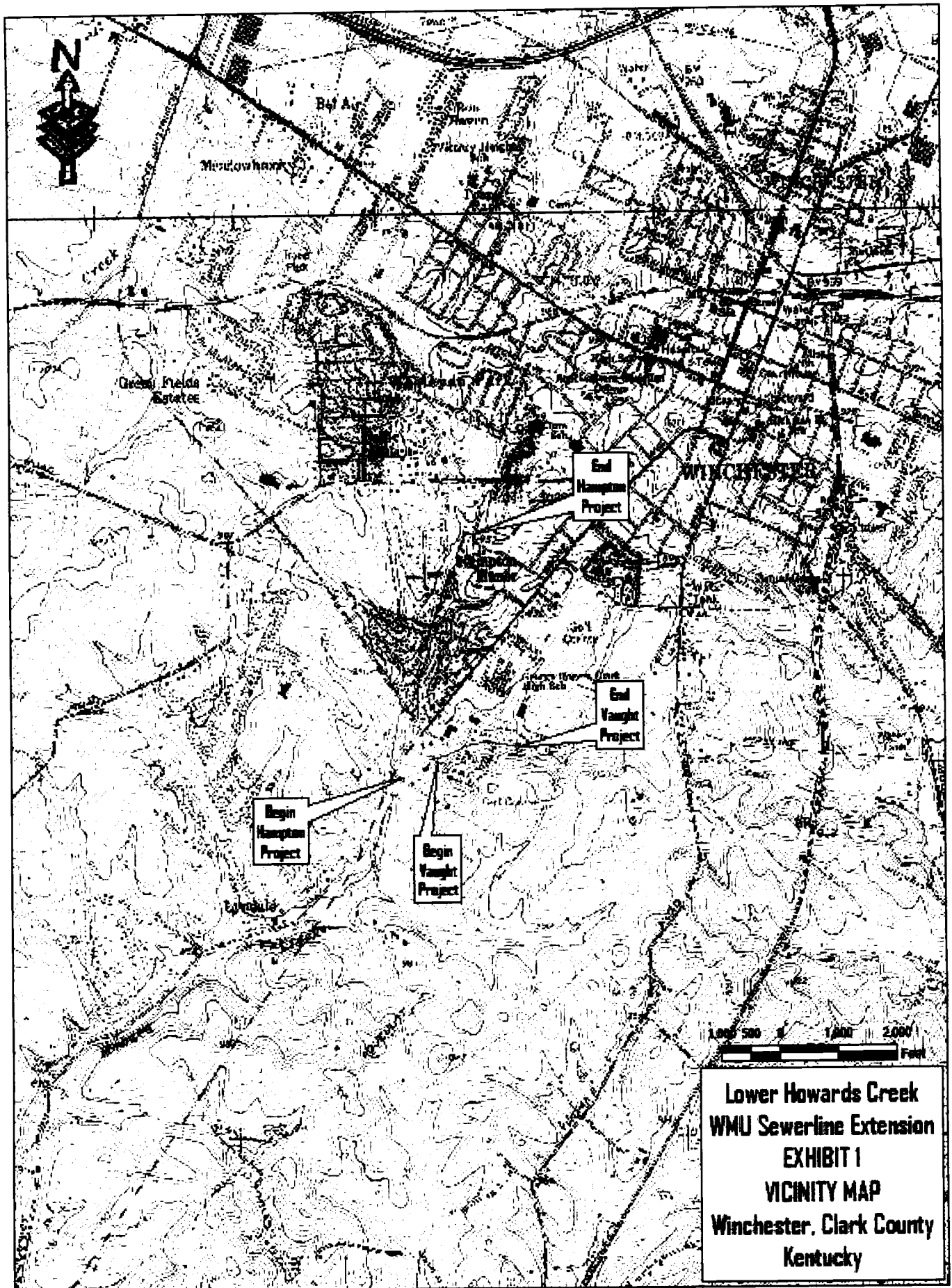
4.0 CONCLUSIONS

Twelve stream crossings, totaling 100.09 ft (0.0147 ac), were identified as potential impacts to jurisdictional waters ("other waters") of the U.S. These "potential impacts" included 26.01 ft (0.00396 ac) of perennial stream channel impacts. The four perennial stream sections were rated as Marginal with an average habitat assessment score of 93.5. The remaining "potential impacts" include 74.08 ft (0.01076 ac) of intermittent stream channel impacts. The eight intermittent stream sections were also rated as Marginal with an average habitat assessment score of 98.

Two wetland areas, totaling 0.649 acres were identified as potential jurisdictional wetlands. Neither of the two wetlands will be impacted by the proposed sewer line project.

Attachment 1
Vicinity Maps

End
Hampton
Project

End
Vaught
Project

WINCHESTER

Begin
Hampton
Project

Begin
Vaught
Project

Lower Howards Creek
WMU Sewerline Extension
EXHIBIT 1
VICINITY MAP
Winchester, Clark County
Kentucky

Attachment 2

Wetland and Stream Crossing Maps

Lower Howards Creek
WMU Sewerline Extension
EXHIBIT 2
DELINEATION MAP
Winchester, Clark County
Kentucky

CROSSING NUMBER	LENGTH OF STREAM CROSSING (FEET)	WIDTH OF STREAM AT CROSSING (FEET)	AREA OF IMPACT IN STREAM (SQUARE FEET)
		HAMPTON MANOR OUTFALL	
1	7.71	8.14	49.82
2	6.99	3.15	19.01
3	6.00	5.67	33.51
4	6.18	6.26	37.91
5	7.14	7.41	45.49
6	7.91	6.89	53.90
7	6.22	6.24	37.55
Total	48.16	43.86	277.13
		VAUGHT ROAD OUTFALL	
8	5.30	11.84	70.17
9	9.45	4.82	48.52
10	5.14	2.81	14.69
11	25.72	8.62	199.11
12	5.18	7.52	38.51
Total	51.93	37.61	365 + 0.0084 ACRES

TOTAL STREAM IMPACTS		
LENGTH OF STREAM CROSSING (FEET)	WIDTH OF STREAM AT CROSSING (FEET)	AREA OF IMPACT IN STREAM (SQUARE FEET)
100.09	81.41	642.19 • 0.015 ACRES

Attachment 3

Soils Map

Lower Howards Creek
WMU Sewerline Extension
EXHIBIT 4
SOIL MAP
Winchester, Clark County
Kentucky

Clark County Soils
Proposed Sewerline
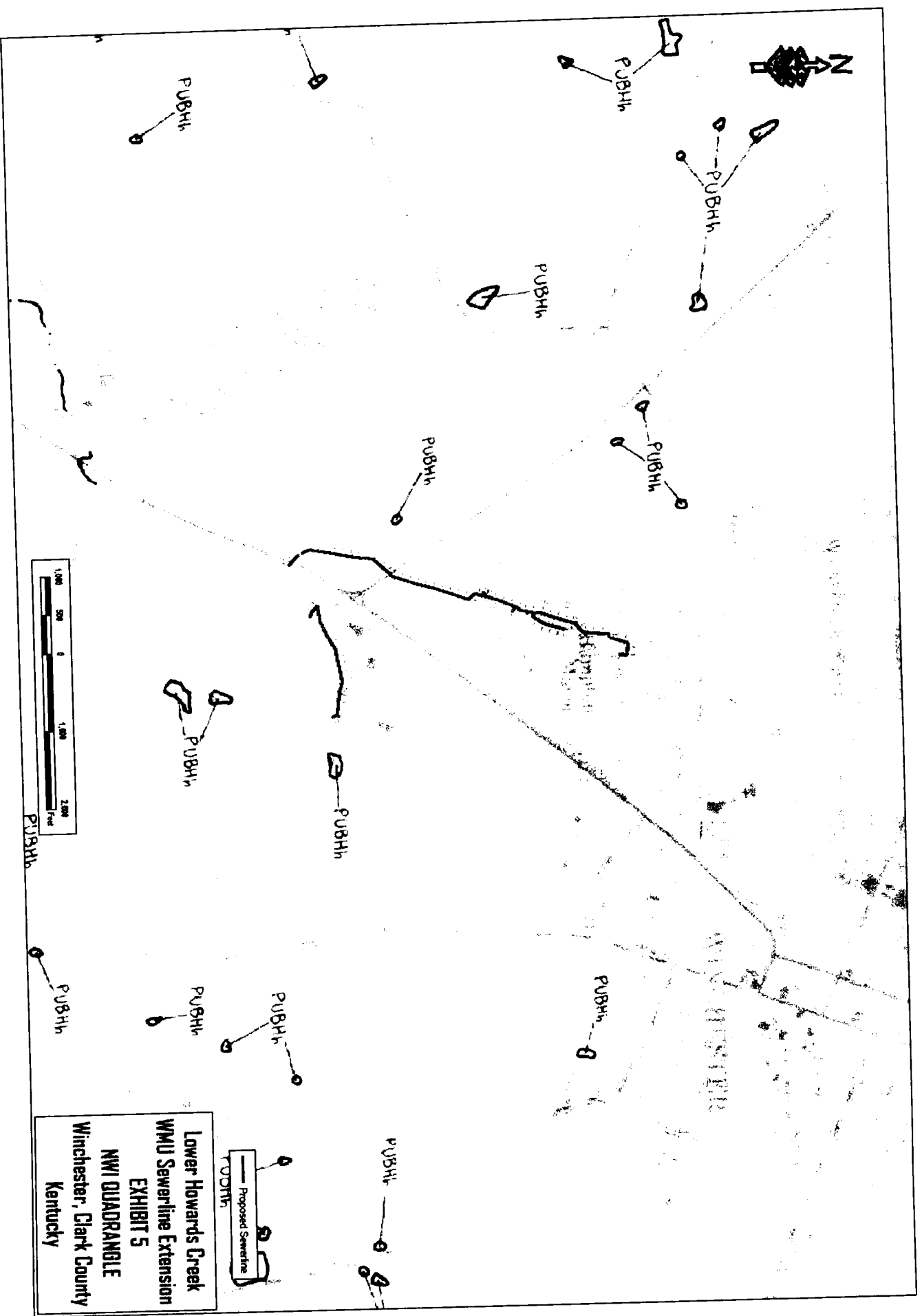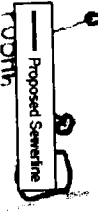
Attachment 4

National Wetland Inventory Map

Lower Howards Creek
WMU Sewerline Extension
EXHIBIT 5
NWI QUADRANGLE
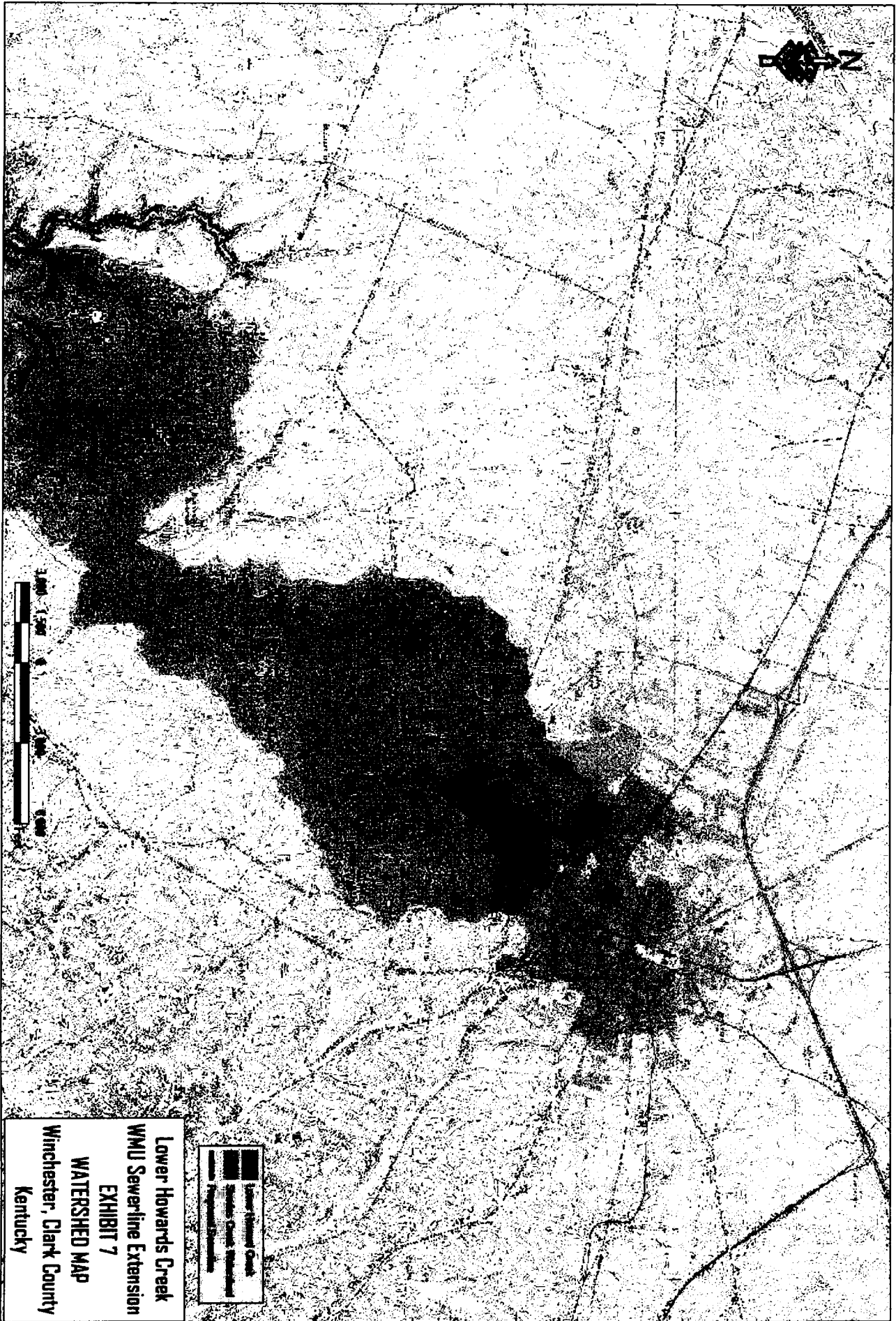Winchester, Clark County
Kentucky

Attachment 5
FEMA Floodplain Map

Lower Howards Creek
WMU Sewerline Extension
EXHIBIT 6
FEMA MAP
Winchester, Clark County
Kentucky

Attachment 6

Watershed Map

Lower Howards Creek
WMU Sewerline Extension
EXHIBIT 7
WATERSHED MAP
Winchester, Clark County
Kentucky

Attachment 7
Existing Land Use Photos

Photo 1. Representative photo of urban/residential land-use

Photo 2. Representative photo of urban/residential land-use

Photo 3. Representative photo of urban/residential land-use

Photo 4. Representative photo of urban land-use

Photo 5. Representative photo of urban/residential land-use

Photo 6. Representative photo of urban/residential land-use

Attachment 8

Wetland No. 1 Photos

Photo 1. Representative photo of Wetland No. 1

Attachment 9
Wetland No. 2 Photos

Photo 1. Representative photo of Wetland No. 2

Photo 2. Representative photo of Wetland No. 2

Attachment 10

Photos of Proposed Stream Crossing Locations

Photo 1. Representative photo of Stream Crossing 01

Photo. 2. Stream Crossing 02

Photo 3. Stream Crossing 03

Photo 4. Stream Crossing 04
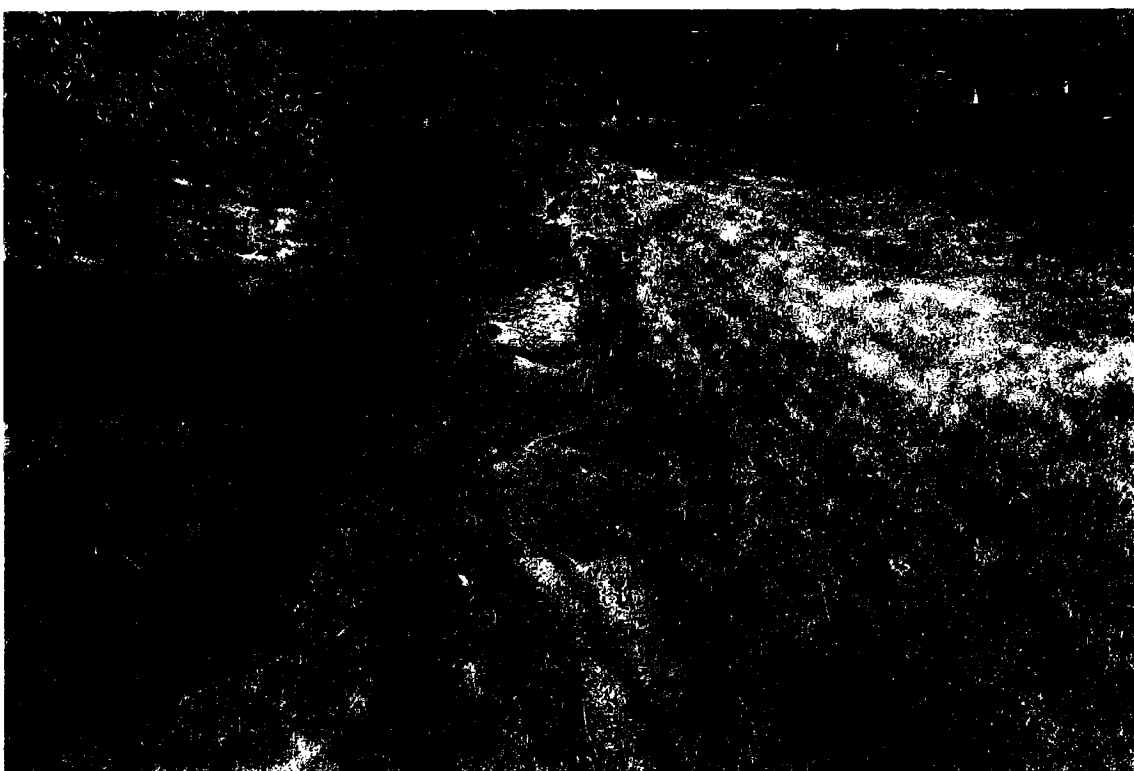
Photo 5. Stream Crossing 05
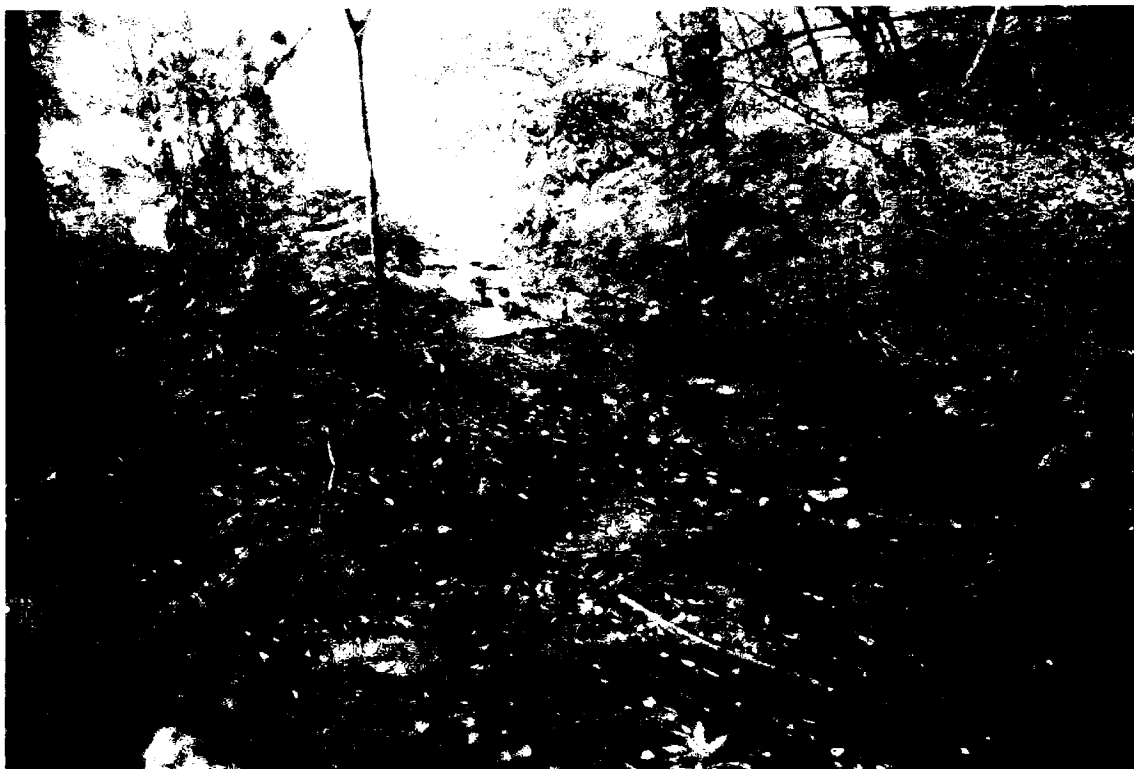

Photo 6. Stream Crossing 06

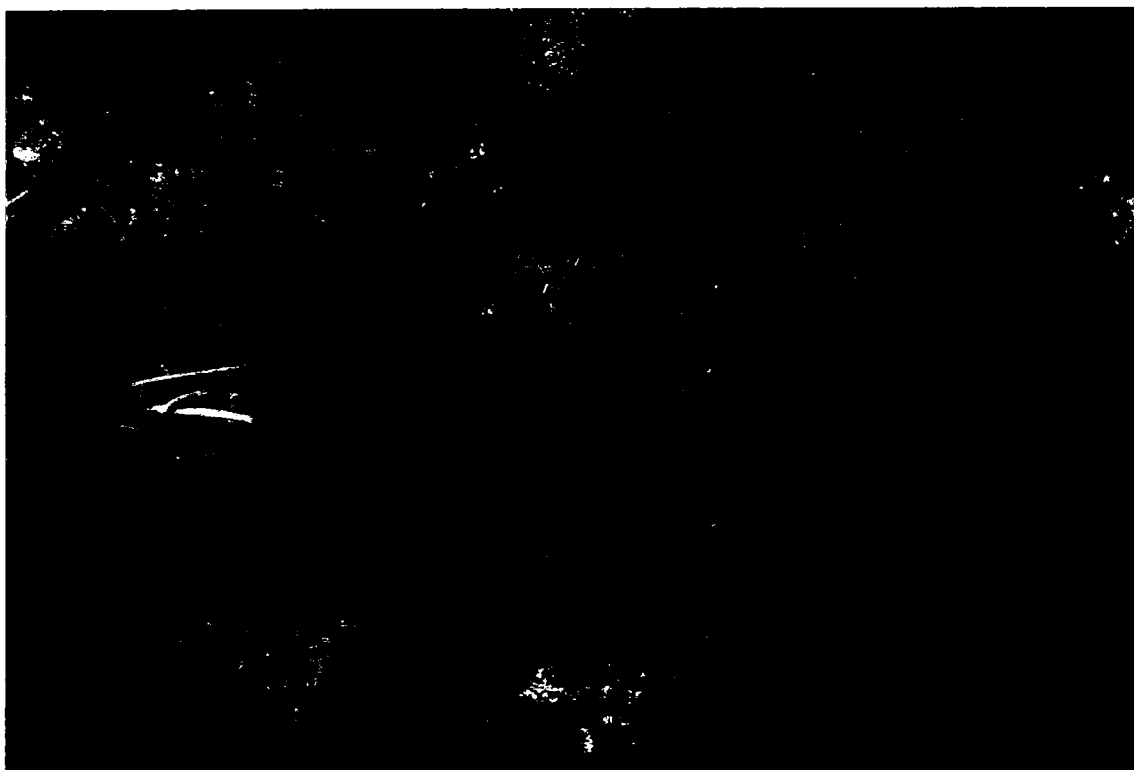Photo 7. Representative photo of Stream Crossing 07

Photo 8. Representative photo of Stream Crossing 08

Photo 9. Stream Crossing 09

Photo 10. Stream Crossing 10

Photo 11. Stream Crossing 11

Photo 12. Stream Crossing 12

Attachment 11

Data Form Routine Wetland Determination
(1987 COE Wetland Delineation Manual)

Data Form
Routine Wetland Determination
(1987 COE Wetland Delineation Manual)

Project/Site: **Hampton / Vaught**	Date: **7/28/08**
Applicant/Owner: **WMV**	County: **Clark**
Investigator: **JJ + LH**	State: **KY**
lat **16S 746495**　long **4206892**	Sampling Site No.: **WSP-01**
Do Normal Circumstances Exist?　(Circle)　**(YES)** NO	Community ID: **✓**
Is the site significantly disturbed?　YES **(NO)**	Transect ID: **—**
Is the area a Problem Area?　YES **(NO)**	Plot ID: **—**
(Explain, If needed, explain on reverse.)	

Vegetation: Dominant Plant Species

Common Name	(Scientific Name)	Stratum	Indicator
1 Curly Dock	Rumex crispus	herb	Fac+
2 Black Willow	Salix nigra	herb	Facw+
3 Fescue	Festuca Sp.	herb	FACU+
4 Dandilion	Taraxacum officinale	herb	FACU
5 Purple clover	Trifolium pratense	herb	FACU+
6 Umbelliphera		herb	
7 Dock	Rumex Sp.	herb	Fac+
8			
9			
10			
11			
12			
13			
14			
15			
16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-). **50%**

Remarks:

Hydrology

(Place a check mark next to those that apply)

Recorded Data (Describe in Remarks):
____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other: explain_____

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: (in)　**None**

Depth of Free Water in Pit: (in)　**None**

Depth of Saturated Soil: (in)　**None**

Wetland Hydrology Indicators:
(Place a check mark next to those that apply)
Primary Indicators:
____ Inundated
____ Saturated in Upper 12 Inches
____ Water Marks
____ Drift Lines
____ Sediment Deposits
____ Drainage Patterns in Wetlands
Secondary Indicators (2 or more):
____ Oxidized Root Channels in upper 12 inches
____ Water-stained Leaves
____ Local Soil Survey Data
____ FAC-Neutral Test
____ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____
Taxonomy (Subgroup): _____	

Profile Description:

Depth (In)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture, Concretions, etc.
0-7	—	10 YR 4/2	—		loamy / gravel
7-16	—	10 YR 5/4	10 YR 6/2	Many/Faint	loamy clay

Hydric Soil Indicators: (Place a check mark next to those that apply)

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors

___Concretions
___High Organic Content in Surface Layer
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes (No)	
Wetland Hydrology Present?	Yes (No)	Is this Sampling Point Within a Wetland? (Circle)
Hydric Soils Present?	Yes (No)	Yes (NO)

Remarks:

Drawing

Lower Howards Creek

WSP-01 X

VAUGHT Rd.

Country Club Road

Data Form
Routine Wetland Determination
(1987 COE Wetland Delineation Manual)

Project/Site: _Hampton / Vaught_   Date: _7/28/08_
Applicant/Owner: _WMU_   County: _Clark_
Investigator: _Jeremy Jackson and Lucas Hill_   State: _KY_
lat _16 746037_   long _4207047_   Sampling Site No.: _WSP-02_

Do Normal Circumstances Exist?   (Circle)   (YES)   NO   Community ID: _✔_
Is the site significantly disturbed?   YES   (NO)   Transect ID: _—_
Is the area a Problem Area?   YES   (NO)   Plot ID: _—_
(Explain, If needed, explain on reverse.)   _Wetland #2_

Vegetation: Dominant Plant Species

Common Name	(Scientific Name)	Stratum	Indicator
1 Sedges	Carex sp.	herb	OBL
2 Rushes	Juncus sp.	herb	OBL
3 Fescue	Festuca officinale	herb	FACU⁺
4 Thistle	Cirsium sp.	herb	FACU⁻
5 Ditch stone crop	Penthorum sedoides	herb	OBL
6 Ironweed	Vernonia sp.	herb	FAC
7 Rosa multiflora	Rosa multiflora	herb	FACU
8			
9			
10			
11			
12			
13			
14			
15			
16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-).   **57 %**

Remarks:

Hydrology

(Place a check mark next to those that apply)

Recorded Data (Describe in Remarks):
____ Stream, Lake, or Tide Gauge
____ Aerial Photographs
____ Other: explain_____

____ No Recorded Data Available

Field Observations:

Depth of Surface Water: (in)   _None_

Depth of Free Water in Pit: (in)   _None_

Depth of Saturated Soil: (in)   _10"_

Wetland Hydrology Indicators:
(Place a check mark next to those that apply)
Primary Indicators:
____ Inundated
✓ Saturated in Upper 12 Inches
____ Water Marks
____ Drift Lines
____ Sediment Deposits
✓ Drainage Patterns in Wetlands
Secondary Indicators (2 or more):
✓ Oxidized Root Channels in upper 12 inches
____ Water-stained Leaves
____ Local Soil Survey Data
____ FAC-Neutral Test
____ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____
Taxonomy (Subgroup): _____	

Profile Description:

Depth (In)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture, Concretions, etc.
0-5	⊢	10 YR 4/2	—		
6-16	—	10 YR 4/1	10 YR 5/6	many/Faint	Silty clay

Hydric Soil Indicators: (Place a check mark next to those that apply)

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
✓ Gleyed or Low-Chroma Colors

___Concretions
___High Organic Content in Surface Layer
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

Wetland Determination

		Is this Sampling Point Within a Wetland? (Circle)
Hydrophytic Vegetation Present?	(Yes) No	
Wetland Hydrology Present?	(Yes) No	
Hydric Soils Present?	(Yes) No	(Yes) NO

Remarks:

Drawing

Data Form
Routine Wetland Determination
(1987 COE Wetland Delineation Manual)

Project/Site: Hampton / Vaught	Date: 7/28/08
Applicant/Owner: WMU	County: Clark
Investigator: Jeremy Jackson and Lucas Hill	State: Winchester, KY
lat 16 S 746021 long 4207048	Sampling Site No.: WSP-03
Do Normal Circumstances Exist? (Circle) (YES) NO	Community ID: ✓
Is the site significantly disturbed? YES (NO)	Transect ID: —
Is the area a Problem Area? YES (NO)	Plot ID: —
(Explain, If needed, explain on reverse.)	Wetland #2

Vegetation: Dominant Plant Species

Common Name	(Scientific Name)	Stratum	Indicator
1 fescue	festuca officinale	herb	Facu+
2 Vetch	Viscia Sp	herb	Upl
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-).

Remarks:

Hydrology

(Place a check mark next to those that apply)

__ Recorded Data (Describe in Remarks):

_____ Stream, Lake, or Tide Gauge

_____ Aerial Photographs

_____ Other: explain_____

__ No Recorded Data Available

Field Observations:

Depth of Surface Water: (in)   None

Depth of Free Water in Pit: (in)   None

Depth of Saturated Soil: (in)   None

Wetland Hydrology Indicators:
(Place a check mark next to those that apply)
Primary Indicators:

____ Inundated

____ Saturated in Upper 12 Inches

____ Water Marks

____ Drift Lines

____ Sediment Deposits

____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more):

____ Oxidized Root Channels in upper 12 inches

____ Water-stained Leaves

____ Local Soil Survey Data

____ FAC-Neutral Test

____ Other (explain in Remarks)

Remarks: No hydrology

SOILS

Map Unit Name (Series and Phase):	Drainage Class:
Taxonomy (Subgroup):	

Profile Description:

Depth (In)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture, Concretions, etc.
0-16		10 YR 3/3			

Hydric Soil Indicators: (Place a check mark next to those that apply)

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors

___Concretions
___High Organic Content in Surface Layer
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes (No)	
Wetland Hydrology Present?	Yes (No)	**Is this Sampling Point Within a Wetland?** (Circle)
Hydric Soils Present?	Yes (No)	Yes (NO)

Remarks:

Drawing

Wetland 2 → × WSP-03

Lower Howard's Creek

Wetland #1

Bypass Road

Boone Avenue

Data Form
Routine Wetland Determination
(1987 COE Wetland Delineation Manual)

Project/Site: _Hampton / Vaught_	Date: _7/29/08_
Applicant/Owner: _WMU_	County: _Clark_
Investigator: _Jeremy Jackson and Lucas Hill_	State: _KY_
lat _16S 746060_ long _4206966_	Sampling Site No.: _WSP-04_
Do Normal Circumstances Exist? (Circle) (YES) NO	Community ID: _✓_
Is the site significantly disturbed? YES (NO)	Transect ID: _—_
Is the area a Problem Area? YES (NO)	Plot ID: _—_
(Explain, If needed, explain on reverse.)	_Wetland #1_

Vegetation: Dominant Plant Species

Common Name	(Scientific Name)	Stratum	Indicator
1 Sedge	Carex	herb	Facw
2 Dock	Rumex crispus	herb	Fac+
3 Rushes	Juncus effusus	herb	Facw
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-).	_100 %_

Remarks:

Hydrology

(Place a check mark next to those that apply)
___ Recorded Data (Describe in Remarks):
_____ Stream, Lake, or Tide Gauge
_____ Aerial Photographs
_____ Other: explain_____

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: (in)   _None_

Depth of Free Water in Pit: (in)   _1"_

Depth of Saturated Soil: (in)   _16"_

Wetland Hydrology Indicators:
(Place a check mark next to those that apply)
Primary Indicators:
_____ Inundated
_✓_ Saturated in Upper 12 Inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands
Secondary Indicators (2 or more):
_✓_ Oxidized Root Channels in upper 12 inches
_____ Water-stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
_____ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name		Drainage Class:	
(Series and Phase):			
Taxonomy (Subgroup):			

Profile Description:

Depth (In)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture, Concretions, etc.
0-7	—	10 YR 4/1	—		Silty clay
8-16	—	10 YR 3/1	10 YR 4/4	Few/Faint	Silty clay

Hydric Soil Indicators: (Place a check mark next to those that apply)

___Histosol   ___Concretions
___Histic Epipedon   ___High Organic Content in Surface Layer
___Sulfidic Odor   ___Organic Streaking in Sandy Soils
___Aquic Moisture Regime   ___Listed on Local Hydric Soils List
___Reducing Conditions   ___Listed on National Hydric Soils List
✓ Gleyed or Low-Chroma Colors   ___Other (Explain in Remarks)

Remarks:

Wetland Determination

		Is this Sampling Point Within a Wetland?
Hydrophytic Vegetation Present?	(Yes) No	(Circle)
Wetland Hydrology Present?	(Yes) No	
Hydric Soils Present?	(Yes) No	(Yes) NO

Remarks:

Drawing

Data Form
Routine Wetland Determination
(1987 COE Wetland Delineation Manual)

Project/Site: _Hampton / Vaught_
Applicant/Owner: _WMU_
Investigator: _Jeremy Jackson and Lucas Hill_
lat _16S 746063_ long _4206946_

Date: _7/29/08_
County: _Clark_
State: _KY_
Sampling Site No.: _WJP-05_
Community ID: _V_
Transect ID: _-_
Plot ID: _-_
Wetland #1

Do Normal Circumstances Exist? (Circle) (YES) NO
Is the site significantly disturbed? YES (NO)
Is the area a Problem Area? YES (NO)
(Explain, If needed, explain on reverse.)

Vegetation: Dominant Plant Species

Common Name	(Scientific Name)	Stratum	Indicator
1 Queen ann's Lace	Daucus carota	herb	Upl
2 milkweed	Asclepias exaltata	herb	FacU
3 Fescue	Festuca rubra	herb	FacU+
4 False bindweed	Calystigia sepium	herb	FAC-
5 Ironweed	Vernonia Sp.	herb	FAC
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-).

Remarks:

Hydrology

(Place a check mark next to those that apply)
_Recorded Data (Describe in Remarks):
_____Stream, Lake, or Tide Gauge
_____Aerial Photographs
_____Other: explain_____

_No Recorded Data Available
Field Observations:

Depth of Surface Water: (in) _None_

Depth of Free Water in Pit: (in) _None_

Depth of Saturated Soil: (in) _None_

Wetland Hydrology Indicators:
(Place a check mark next to those that apply)
Primary Indicators:
_____ Inundated
_____ Saturated in Upper 12 Inches
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands
Secondary Indicators (2 or more):
_____ Oxidized Root Channels in upper 12 inches
_____ Water-stained Leaves
_____ Local Soil Survey Data
_____ FAC-Neutral Test
Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): _____	Drainage Class: _____
Taxonomy (Subgroup): _____	

Profile Description:

Depth (In)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance	Texture, Concretions, etc.
0-7	—	10 YR 5/3			Loamy
7-16	—	10 YR 5/2			Loamy

Hydric Soil Indicators: (Place a check mark next to those that apply)

___Histosol

___Histic Epipedon

___Sulfidic Odor

___Aquic Moisture Regime

___Reducing Conditions

___Gleyed or Low-Chroma Colors

___Concretions

___High Organic Content in Surface Layer

___Organic Streaking in Sandy Soils

___Listed on Local Hydric Soils List

___Listed on National Hydric Soils List
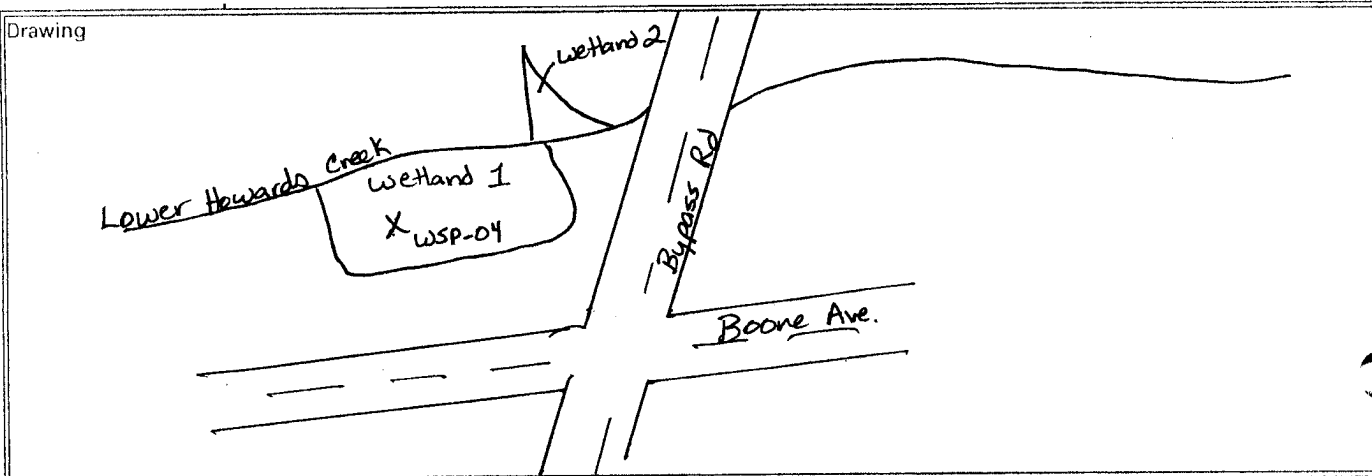
___Other (Explain in Remarks)

Remarks:

Wetland Determination

Hydrophytic Vegetation Present?	Yes (No)	Is this Sampling Point Within a Wetland? (Circle)
Wetland Hydrology Present?	Yes (No)	
Hydric Soils Present?	Yes (No)	Yes (NO)

Remarks:

Drawing

Lower Howards Creek   Wetland #1   Wetland #2   Bypass Rd   Boone Ave.   →X WSP-05

Attachment 12

EPA Low Gradient Stream Assessment Data Sheets

Low Gradient Stream Data Sheet

Stream Name: _Lower Howards Creek_	Location: WMU _S.C.-01_
Station #: _10+50_ Mile:	Basin/Watershed: _LHC_
LAT.: LONG.:	County: _Clark_ USGS 7.5 TOPO:
Date: _7/28/08_ Time: _1:00_ AM (PM)	Investigators: _LH_

Type Sample: P-Chem   Macroinvertebrate   Fish   Bacteria

Weather: Now   Past 24 hours   Has there been heavy rain in last 7 days?

          e Heavy Rain   (Yes)   No

          e Steady Rain   Air Temperature _85_ °F.

          (e Intermittent Showers)   Inches rainfall in past 24 hours _.2_ in

          (e Clear/Sunny)   _20_ % Cloud Cover.

P-Chem: Temp (°C)____   D.O. (mg/l)____   %Saturation____   pH (S.U.)____   Cond.____   Grab

Instream Watershed Features:	Local Watershed Features: Predominate Surrounding Land Use:		
Stream Width: _4'-8'_	e Surface Mining	e Construction	e Forest
Range of Depth: ____	e Deep Mining	e Commercial	e Pasture / Grazing
Average Velocity: ____ ft/s	e Oil Wells	e Industrial	e Silviculture
Discharge: ____ cfs	e Land Disposal	e Row Crops	(e Urban Runoff / Storm Sewers)
Est. Reach Length: ____			

Hydraulic Structures:		Stream Flow:			Stream Type:	
e Dams	e Bridge Abutments	e Dry	e Pooled	(e Low)	(e Perennial)	e Intermittent
e Island	e Waterfalls	e Normal	e High		e Ephemeral	e Seep
e Other ____		e Very Rapid or Torrential				

Riparian Vegetation:	Dom. Tree / Shrub Taxa	Canopy Cover:	Channel Alterations:
Dominate Type:		(e Fully Exposed (0-25%))	e Dredging
e Trees (e Shrubs)		e Partially Shaded (25-50%)	e Channelization
(e Grasses) (e Herbaceous)		e Partially Exposed (50-75%)	(e Full or e Partial)
Number of Strata ____		e Fully Shaded (75-100%)	

Substrate e Est. e P.C.	Riffle _30_ %	Run _10_ %	Pool _60_ %
Silt / Clay (< 0.06 mm)			
Sand (0.06 - 2 mm)	_10_	_10_	_10_
Gravel (2 - 64 mm)	_60_	_60_	_60_
Cobble (64 - 256 mm)	_30_	_30_	_30_
Boulders (> 256 mm)			
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate / Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less then desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious, substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE ____	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pool large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE ____	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1

Notes and Comments:

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently' pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderatly unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including shrubs, or nonwoody macrophytes; vegeative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activites have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activity.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 (0)

TOTAL SCORE 111

Low Gradient Stream Data Sheet

Stream Name: _Lower Howard's Creek_	Location: _WMU S.C. – 03_
Station #: _32+25_ Mile:	Basin/Watershed: _LHC_
LAT.: LONG.:	County: _Clark_ USGS 7.5 TOPO:
Date: _7/28/08_ Time: _1:00_ AM (PM)	Investigators: _LH + JJ_

Type Sample: P-Chem   Macroinvertebrate   Fish   Bacteria

Weather:	Now	Past 24 hours	Has there been heavy rain in last 7 days?
		ө Heavy Rain	(Yes) No
		ө Steady Rain	Air Temperature **85** °F.
		(ө Intermittent Showers)	Inches rainfall in past 24 hours _.2_ in
		(ө Clear/Sunny)	_20_ % Cloud Cover.

P-Chem: Temp (°C)____   D.O. (mg/l)____   %Saturation____   pH (S.U.)____   Cond.____   Grab____

Instream Watershed Features:	Local Watershed Features:		
Stream Width: **4'**	Predominate Surrounding Land Use:		
Range of Depth: ____	ө Surface Mining	ө Construction	ө Forest
Average Velocity: ____ft/s	ө Deep Mining	ө Commercial	ө Pasture / Grazing
Discharge: ____cfs	ө Oil Wells	ө Industrial	ө Silviculture
Est. Reach Length: ____	ө Land Disposal	ө Row Crops	(ө Urban Runoff / Storm Sewers)

Hydraulic Structures:		Stream Flow:			Stream Type:	
ө Dams	(ө Bridge Abutments)	ө Dry	ө Pooled	(ө Low)	(ө Perennial)	ө Intermittent
ө Island	ө Waterfalls	ө Normal	ө High		ө Ephemeral	ө Seep
ө Other ____		ө Very Rapid or Torrential				

Riparian Vegetation: Dom. Tree / Shrub Taxa	Canopy Cover:	Channel Alterations:
Dominate Type:	(ө Fully Exposed (0-25%))	ө Dredging
ө Trees ө Shrubs	ө Partially Shaded (25-50%)	ө Channelization
(ө Grasses) (ө Herbaceous)	ө Partially Exposed (50-75%)	(ө Full or ө Partial)
Number of Strata ____	ө Fully Shaded (75-100%)	

Substrate ө Est. ө P.C.	Riffle _50_ %	Run _20_ %	Pool _30_ %
Silt / Clay (< 0.06 mm)			
Sand (0.06 - 2 mm)	30	30	30
Gravel (2 - 64 mm)	50	50	50
Cobble (64 - 256 mm)	20	20	20
Boulders (> 256 mm)			
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate / Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less then desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pool large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1

Notes and Comments:

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderatly unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including shrubs, or nonwoody macrophytes; vegeative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in stubble height.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activites have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activity.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 (0)

TOTAL SCORE 108

Low Gradient Stream Data Sheet

Stream Name: Unamed trib - of Lower Howard Cr.	Location: WMU -	S.C.-03
Station #: 33+50	Mile:	Basin/Watershed: LHC
LAT.:	LONG.:	County: Clark USGS 7.5 TOPO:
Date: 7/28/08 Time: 1:30 AM (PM)		Investigators: LH + JJ

Type Sample: P-Chem   Macroinvertebrate   Fish   Bacteria

Weather:

	Now	Past 24 hours	Has there been heavy rain in last 7 days?
		ө Heavy Rain	(Yes) No
		ө Steady Rain	Air Temperature 85 °F.
		(ө Intermittent Showers)	Inches rainfall in past 24 hours .2 in
		(ө Clear/Sunny)	20 % Cloud Cover.

P-Chem:	Temp (°C)___	D.O. (mg/l)___	%Saturation___	pH (S.U.)___	Cond.___	Grab___

Instream Watershed Features:	Local Watershed Features:		
	Predominate Surrounding Land Use:		
Stream Width: 4'	ө Surface Mining	ө Construction	ө Forest
Range of Depth: 8"	ө Deep Mining	ө Commercial	ө Pasture / Grazing
Average Velocity: 0 ft/s	ө Oil Wells	ө Industrial	ө Silviculture
Discharge: 0 cfs	ө Land Disposal	ө Row Crops	X Urban Runoff / Storm Sewers
Est. Reach Length: 40'			

Hydraulic Structures:		Stream Flow:		Stream Type:	
ө Dams	ө Bridge Abutments	ө Dry	(ө Pooled) ө Low	(ө Perennial)	ө Intermittent
ө Island	ө Waterfalls	ө Normal ө High		ө Ephemeral	ө Seep
ө Other 48" Culvert		ө Very Rapid or Torrential			

Riparian Vegetation: Dom. Tree / Shrub Taxa	Canopy Cover:	Channel Alterations:
Dominate Type:	(ө Fully Exposed (0-25%))	ө Dredging
ө Trees ө Shrubs	ө Partially Shaded (25-50%)	(ө Channelization)
(ө Grasses) ө Herbaceous	ө Partially Exposed (50-75%)	(ө Full or ө Partial)
Number of Strata ___	ө Fully Shaded (75-100%)	

Substrate ө Est. ө P.C.	Riffle ___ %	Run ___ %	Pool 100 %
Silt / Clay (< 0.06 mm)			100
Sand (0.06 - 2 mm)			
Gravel (2 - 64 mm)			
Cobble (64 - 256 mm)			
Boulders (> 256 mm)			
Bedrock			

Habitat	Condition Category			
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate / Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonication potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less then desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pool large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1

Notes and Comments:

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1)
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1)
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderatly unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including shrubs, or nonwoody macrophytes; vegeative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 (0)
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activites have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activity.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 (0)

TOTAL SCORE 52

Low Gradient Stream Data Sheet

Stream Name: *Lower Howard's Creek*	Location: *WMU S.C.-04*
Station #: *58+25* Mile:	Basin/Watershed: *LHC*
LAT.: LONG.:	County: *Clark* USGS 7.5 TOPO:
Date: *May 21, 09* Time: *1:30* AM (PM)	Investigators: *LH + JJ*

Type Sample: P-Chem   Macroinvertebrate   Fish   Bacteria

Weather:

	Now	Past 24 hours	Has there been heavy rain in last 7 days?
		ɵ Heavy Rain	Yes (No)
		ɵ Steady Rain	Air Temperature *80* °F.
		ɵ Intermittent Showers	Inches rainfall in past 24 hours *0* in
		(ɵ Clear/Sunny)	*25* % Cloud Cover.

P-Chem: Temp (°C)____   D.O. (mg/l)____   %Saturation____   pH (S.U.)____   Cond.____   Grab____

Instream Watershed Features:	Local Watershed Features: Predominate Surrounding Land Use:		
Stream Width: *2.25*	ɵ Surface Mining	ɵ Construction	ɵ Forest
Range of Depth: *1-8"*	ɵ Deep Mining	ɵ Commercial	ɵ Pasture / Grazing
Average Velocity: *0.25* ft/s	ɵ Oil Wells	ɵ Industrial	ɵ Silviculture
Discharge: ____ cfs	ɵ Land Disposal	ɵ Row Crops	(ɵ Urban Runoff / Storm Sewers)
Est. Reach Length: *100'*			

Hydraulic Structures:		Stream Flow:			Stream Type:	
ɵ Dams	ɵ Bridge Abutments	ɵ Dry	(ɵ Pooled)	ɵ Low	ɵ Perennial	(ɵ Intermittent)
ɵ Island	ɵ Waterfalls	ɵ Normal	ɵ High		ɵ Ephemeral	ɵ Seep
ɵ Other _____		ɵ Very Rapid or Torrential				

Riparian Vegetation: Dominate Type:	Dom. Tree / Shrub Taxa	Canopy Cover:	Channel Alterations:
ɵ Trees ɵ Shrubs		(ɵ Fully Exposed (0-25%))	ɵ Dredging
(ɵ Grasses) ɵ Herbaceous		ɵ Partially Shaded (25-50%)	(ɵ Channelization)
Number of Strata *1*		ɵ Partially Exposed (50-75%)	(ɵ Full or ɵ Partial)
		ɵ Fully Shaded (75-100%)	

Substrate ɵ Est. ɵ P.C.	Riffle *10* %	Run *10* %	Pool *80* %
Silt / Clay (< 0.06 mm)	*10*	*10*	*40*
Sand (0.06 - 2 mm)	*30*	*30*	*40*
Gravel (2 - 64 mm)	*30*	*30*	*20*
Cobble (64 - 256 mm)	*30*	*30*	
Boulders (> 256 mm)			
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate / Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged lobs, undercut banks, cobble or other stable habitat and at stage to allow full colonication potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less then desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE __	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pool large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE __	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1

Notes and Comments:

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE __ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE __ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in stubble height.
SCORE __ (LB)	Left Bank 10 9	8 7 6	5 4 (3)	2 1 0
SCORE __ (RB)	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activites have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activity.
SCORE __ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 (1) 0
SCORE __ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 (1) 0

TOTAL SCORE 77

Low Gradient Stream Data Sheet

Stream Name: *Lower Howard's Creek*	Location: WMU 5.C. -05
Station #: 60 + 40　　Mile:	Basin/Watershed: LHC
LAT.:　　　　LONG.:	County: Clark　USGS 7.5 TOPO:
Date: 7/28/08　Time:　　AM　　PM	Investigators: LH + JJ

Type Sample:　P-Chem　Macroinvertebrate　Fish　Bacteria

Weather:

	Now	Past 24 hours	Has there been heavy rain in last 7 days?
		ө Heavy Rain	(Yes)　　No
		ө Steady Rain	Air Temperature 85 °F.
		(ө Intermittent Showers)	Inches rainfall in past 24 hours .2 in
		(ө Clear/Sunny)	20 % Cloud Cover.

P-Chem:　Temp (°C)___　D.O. (mg/l)___　%Saturation___　pH (S.U.)___　Cond.___　Grab___

Instream Watershed Features:	Local Watershed Features: Predominate Surrounding Land Use:		
Stream Width: 7'	ө Surface Mining	ө Construction	ө Forest
Range of Depth: ___	ө Deep Mining	ө Commercial	ө Pasture / Grazing
Average Velocity: ___ ft/s	ө Oil Wells	ө Industrial	ө Silviculture
Discharge: ___ cfs	ө Land Disposal	ө Row Crops	(ө Urban Runoff / Storm Sewers)
Est. Reach Length: ___			

Hydraulic Structures:	Stream Flow:			Stream Type:	
ө Dams　(ө Bridge Abutments)	ө Dry	(ө Pooled)	ө Low	ө Perennial	(ө Intermittent)
ө Island　　ө Waterfalls	ө Normal	ө High		ө Ephemeral	ө Seep
ө Other ___	ө Very Rapid or Torrential				

Riparian Vegetation: Dominate Type:	Dom. Tree / Shrub Taxa	Canopy Cover:	Channel Alterations:
ө Trees　(ө Shrubs)	*Lonicera*	ө Fully Exposed (0-25%)	ө Dredging
(ө Grasses)　(ө Herbaceous)		ө Partially Shaded (25-50%)	ө Channelization
Number of Strata 3		(ө Partially Exposed (50-75%))	(ө Full or ө Partial)
		ө Fully Shaded (75-100%)	

Substrate ө Est. ө P.C.	Riffle 34 %	Run 33 %	Pool 33 %
Silt / Clay (< 0.06 mm)			
Sand (0.06 - 2 mm)	25	25	50
Gravel (2 - 64 mm)	50	50	25
Cobble (64 - 256 mm)	25	25	25
Boulders (> 256 mm)			
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate / Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonication potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less then desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20　19　18　17　16	15　14　13　12　11	(10)　9　8　7　6	5　4　3　2　1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE ___	20　19　18　17　16	15　14　13　12　11	10　9　8　7　(6)	5　4　3　2　1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pool large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE ___	20　19　18　17　16	15　14　13　12　11	10　9　8　7　(6)	5　4　3　2　1

Notes and Comments:

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently' pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderatly unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including shrubs, or nonwoody macrophytes; vegevative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in stubble height.
SCORE (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activites have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activity.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0

TOTAL SCORE 94

Low Gradient Stream Data Sheet

Stream Name: Lower Howards Creek	Location: S.C. - 06
Station #: 66 +20 Mile:	Basin/Watershed: LHC
LAT.: LONG.:	County: Clark USGS 7.5 TOPO:
Date: 7/28/08 Time: AM PM	Investigators: LH + SS

Type Sample: P-Chem Macroinvertebrate Fish Bacteria

Weather: Clear

Now	Past 24 hours	Has there been heavy rain in last 7 days?
	ө Heavy Rain	(Yes) No
	ө Steady Rain	Air Temperature 85 °F.
	ө Intermittent Showers	Inches rainfall in past 24 hours 0.2 in
	(ө Clear/Sunny)	30 % Cloud Cover.

P-Chem: Temp (°C)___ D.O. (mg/l)___ %Saturation___ pH (S.U.)___ Cond.___ Grab___

Instream Watershed Features:	Local Watershed Features:
Stream Width: 3'	Predominate Surrounding Land Use:
Range of Depth: ___	
Average Velocity: ___ ft/s	
Discharge: ___ cfs	
Est. Reach Length: ___	

ө Surface Mining	ө Construction	ө Forest
ө Deep Mining	ө Commercial	ө Pasture / Grazing
ө Oil Wells	ө Industrial	ө Silviculture
ө Land Disposal	ө Row Crops	(ө Urban Runoff / Storm Sewers)

Hydraulic Structures:		Stream Flow:			Stream Type:	
ө Dams	ө Bridge Abutments	ө Dry	(Pooled)	ө Low	ө Perennial	(ө Intermittent)
ө Island	ө Waterfalls	ө Normal	ө High		ө Ephemeral	ө Seep
ө Other ___		ө Very Rapid or Torrential				

Riparian Vegetation: Dom. Tree / Shrub Taxa	Canopy Cover:	Channel Alterations:
Dominate Type:	(ө Fully Exposed (0-25%))	ө Dredging
ө Trees ө Shrubs	ө Partially Shaded (25-50%)	(ө Channelization)
(ө Grasses) ө Herbaceous	ө Partially Exposed (50-75%)	(ө Full or ө Partial)
Number of Strata ___	ө Fully Shaded (75-100%)	

Substrate ө Est. ө P.C.	Riffle 15 %	Run 5 %	Pool 80 %
Silt / Clay (< 0.06 mm)			
Sand (0.06 - 2 mm)	15	15	15
Gravel (2 - 64 mm)	75	75	75
Cobble (64 - 256 mm)	10	10	10
Boulders (> 256 mm)			
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate / Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonication potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less then desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pool large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1

Notes and Comments:

	Optimal	Suboptimal	Marginal	Poor
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20　19　18　17　16	15　14　13　12　11	(10)　9　8　7　6	5　4　3　2　1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20　19　18　17　16	15　14　13　12　11	10　(9)　8　7　6	5　4　3　2　1
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20　19　18　17　16	15　14　13　12　11	10　9　8　7　6	5　4　3　2　(1)
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20　19　18　17　16	15　14　13　12　11	10　9　8　7　6	5　4　3　2　(1)
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderatly unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank　10　(9)	8　7　6	5　4　3	2　1　0
SCORE ___ (RB)	Right Bank　10　(9)	8　7　6	5　4　3	2　1　0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in stubble height.
SCORE ___ (LB)	Left Bank　10　9	8　7　6	5　4　3	(2)　1　0
SCORE ___ (RB)	Right Bank　10　9	8　7　6	5　4　3	(2)　1　0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activites have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activity.
SCORE ___ (LB)	Left Bank　10　9	8　7　6	5　4　3	2　(1)　0
SCORE ___ (RB)	Right Bank　10　9	8　7　6	5　4　3	2　(1)　0

TOTAL SCORE 59

Low Gradient Stream Data Sheet

Stream Name: _Lower Howards Creek_	Location: _WMU S.C.-07_
Station #: _50+00_ Mile:	Basin/Watershed: _LHC_
LAT.: LONG.:	County: _Clark_ USGS 7.5 TOPO:
Date: _7/28/08_ Time: AM PM	Investigators: _LH + JJ_

Type Sample: P-Chem   Macroinvertebrate   Fish   Bacteria

Weather: Now   Past 24 hours   Has there been heavy rain in last 7 days?
                                           ө Heavy Rain   (Yes)   No
                                           ө Steady Rain   Air Temperature ___ °F.
                                           ө Intermittent Showers   Inches rainfall in past 24 hours___ in
                                           (ө Clear/Sunny)   _30_% Cloud Cover.

P-Chem: Temp (°C)___   D.O. (mg/l)___   %Saturation___   pH (S.U.)___   Cond.___   Grab___

Instream Watershed Features:	Local Watershed Features: Predominate Surrounding Land Use:		
Stream Width: _5'_	ө Surface Mining	ө Construction	ө Forest
Range of Depth: ___	ө Deep Mining	ө Commercial	ө Pasture / Grazing
Average Velocity: ___ft/s	ө Oil Wells	ө Industrial	ө Silviculture
Discharge: ___cfs	ө Land Disposal	ө Row Crops	(ө Urban Runoff / Storm Sewers)
Est. Reach Length: ___			

Hydraulic Structures:	Stream Flow:	Stream Type:
ө Dams ө Bridge Abutments	ө Dry (ө Pooled) ө Low	ө Perennial (ө Intermittent)
ө Island ө Waterfalls	ө Normal ө High	ө Ephemeral ө Seep
ө Other _____	ө Very Rapid or Torrential	

Riparian Vegetation: Dom. Tree / Shrub Taxa	Canopy Cover:	Channel Alterations:
Dominate Type:	ө Fully Exposed (0-25%)	ө Dredging
(ө Trees) (ө Shrubs)	ө Partially Shaded (25-50%)	(ө Channelization)
(ө Grasses) (ө Herbaceous)	ө Partially Exposed (50-75%)	(ө Full or ө Partial)
Number of Strata ___	(ө Fully Shaded (75-100%))	

Substrate ө Est. ө P.C.	Riffle _33_ %	Run _33_ %	Pool _34_ %
Silt / Clay (< 0.06 mm)			
Sand (0.06 - 2 mm)	20	20	20
Gravel (2 - 64 mm)	40	40	40
Cobble (64 - 256 mm)	40	40	40
Boulders (> 256 mm)			
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate / Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less then desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat, lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pool large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1

Notes and Comments:

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently' pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1

5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1

6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1

7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1

8. Bank Stability (score each bank) Note: determine left or right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderatly unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0

9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including shrubs, or nonwoody macrophytes; vegeative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in stubble height.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0

10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activites have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activity.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0

TOTAL SCORE 8 7

Low Gradient Stream Data Sheet

Stream Name: _Lower Howard Creek_		Location: _WMU J.C. - 08_	
Station #: _21 +00_	Mile:	Basin/Watershed: _Lower Howard Creek_	
LAT.:	LONG.:	County: _Clark_	USGS 7.5 TOPO:
Date: _7/28/08_	Time: AM PM	Investigators: _LH + JJ_	

Type Sample: P-Chem   Macroinvertebrate   Fish   Bacteria

Weather: _Clear_   Now   Past 24 hours

- ө Heavy Rain
- ө Steady Rain
- (ө Intermittent Showers)
- (ө Clear/Sunny)

Has there been heavy rain in last 7 days?
(Yes)   No
Air Temperature _85_ °F.
Inches rainfall in past 24 hours _2_ in
_20_ % Cloud Cover.

P-Chem: Temp (°C)____   D.O. (mg/l)____   %Saturation____   pH (S.U.)____   Cond.____   Grab____

Instream Watershed Features:	Local Watershed Features:

Instream Watershed Features:
Stream Width: _8'-12'_
Range of Depth: ____
Average Velocity: ____ ft/s
Discharge: ____ cfs
Est. Reach Length: ____

Local Watershed Features:
Predominate Surrounding Land Use:

ө Surface Mining	ө Construction	ө Forest
ө Deep Mining	ө Commercial	ө Pasture / Grazing
ө Oil Wells	ө Industrial	ө Silviculture
ө Land Disposal	ө Row Crops	(ө Urban Runoff / Storm Sewers)

Hydraulic Structures:
- ө Dams   ө Bridge Abutments
- ө Island   ө Waterfalls
- ө Other _____

Stream Flow:
- ө Dry   (ө Pooled)   ө Low
- ө Normal   ө High
- ө Very Rapid or Torrential

Stream Type:
- ө Perennial   (ө Intermittent)
- ө Ephemeral   ө Seep

Riparian Vegetation: Dom. Tree / Shrub Taxa
Dominate Type:
- (ө Trees)   (ө Shrubs)
- ө Grasses   (ө Herbaceous)
- Number of Strata

Canopy Cover:
- ө Fully Exposed (0-25%)
- ө Partially Shaded (25-50%)
- ө Partially Exposed (50-75%)
- (ө Fully Shaded (75-100%))

Channel Alterations:
- ө Dredging
- ө Channelization
- (ө Full or ө Partial)

Substrate ө Est. ө P.C.	Riffle _30_ %	Run _10_ %	Pool _60_ %
Silt / Clay (< 0.06 mm)			
Sand (0.06 - 2 mm)			
Gravel (2 - 64 mm)	_50_	_50_	_50_
Cobble (64 - 256 mm)	_50_	_50_	_50_
Boulders (> 256 mm)			
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate / Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged lobs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less then desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pool large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1

Notes and Comments:

Parameter	Optimal	Suboptimal	Marginal	Poor
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderatly unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including shrubs, or nonwoody macrophytes; vegeative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activites have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activity.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0

TOTAL SCORE *103*

Low Gradient Stream Data Sheet

Stream Name: Unamed Trib. of LHC	Location: WMU S.C. -09 + 10
Station #: 24+36 Mile:	Basin/Watershed: LHC
LAT.: LONG.:	County: Clark USGS 7.5 TOPO:
Date: 7/28/08 Time: AM PM	Investigators: LH + JJ

Type Sample: P-Chem   Macroinvertebrate   Fish   Bacteria

Weather:

	Now	Past 24 hours	Has there been heavy rain in last 7 days?
		ө Heavy Rain	Yes (No)
		ө Steady Rain	Air Temperature 80 °F.
		ө Intermittent Showers	Inches rainfall in past 24 hours 0 in
		(ө Clear/Sunny)	25 % Cloud Cover.

P-Chem: Temp (°C)___   D.O. (mg/l)___   %Saturation___   pH (S.U.)___   Cond.___   Grab___

Instream Watershed Features:	Local Watershed Features: Predominate Surrounding Land Use:		
Stream Width: 3'	ө Surface Mining	ө Construction	ө Forest
Range of Depth: 1"-4"	ө Deep Mining	ө Commercial	ө Pasture / Grazing
Average Velocity: .01 ft/s	ө Oil Wells	ө Industrial	ө Silviculture
Discharge: ___ cfs	ө Land Disposal	ө Row Crops	(ө Urban Runoff / Storm Sewers)
Est. Reach Length: 50'			

Hydraulic Structures:	Stream Flow:			Stream Type:	
ө Dams ө Bridge Abutments	ө Dry	ө Pooled	ө Low	(ө Perennial)	ө Intermittent
ө Island ө Waterfalls	ө Normal	ө High		ө Ephemeral	ө Seep
✓Other Culvert above	ө Very Rapid or Torrential				

Riparian Vegetation: Dom. Tree / Shrub Taxa	Canopy Cover:	Channel Alterations:
Dominate Type:	ө Fully Exposed (0-25%)	ө Dredging
ө Trees ө Shrubs	(ө Partially Shaded (25-50%))	(ө Channelization)
(ө Grasses) (ө Herbaceous)	ө Partially Exposed (50-75%)	(ө Full) or ө Partial)
Number of Strata ___	ө Fully Shaded (75-100%)	

Substrate ө Est. ө P.C.	Riffle 20 %	Run ___ %	Pool 80 %
Silt / Clay (< 0.06 mm)	5		5
Sand (0.06 - 2 mm)	10		20
Gravel (2 - 64 mm)	60		70
Cobble (64 - 256 mm)	20		5
Boulders (> 256 mm)	0		
Bedrock	5		

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate / Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged lobs, undercut banks, cobble or other stable habitat and at stage to allow full colonication potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less then desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE ___	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pool large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE ___	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Notes and Comments:

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderatly unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including shrubs, or nonwoody macrophytes; vegeative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activites have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activity.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0

TOTAL SCORE 144

Low Gradient Stream Data Sheet

Stream Name: *Lower Howards Crook*	Location: *WMU S.C. - 11 + 12*
Station #: *14+00 15+00* Mile:	Basin/Watershed: *LHC*
LAT.: LONG.:	County: *Clark* USGS 7.5 TOPO:
Date: *7/28/08* Time: AM PM	Investigators: *LH + JJ*

Type Sample: P-Chem   Macroinvertebrate   Fish   Bacteria

Weather:	Now	Past 24 hours	Has there been heavy rain in last 7 days?
		ө Heavy Rain	(Yes) No
		ө Steady Rain	Air Temperature *75*°F.
		ө Intermittent Showers	Inches rainfall in past 24 hours *.2* in
		(ө Clear/Sunny)	*20* % Cloud Cover.

P-Chem: Temp (°C)____   D.O. (mg/l)____   %Saturation____   pH (S.U.)____   Cond.____   Grab____

Instream Watershed Features:	Local Watershed Features: Predominate Surrounding Land Use:		
Stream Width: **5**	ө Surface Mining	ө Construction	ө Forest
Range of Depth: ____	ө Deep Mining	ө Commercial	ө Pasture / Grazing
Average Velocity: ____ft/s	ө Oil Wells	ө Industrial	ө Silviculture
Discharge: ____cfs	ө Land Disposal	ө Row Crops	(ө Urban Runoff / Storm Sewers)
Est. Reach Length: *250'*			

Hydraulic Structures:	Stream Flow:	Stream Type:
ө Dams ө Bridge Abutments	ө Dry (ө Pooled) ө Low	ө Perennial (ө Intermittent)
ө Island ө Waterfalls	ө Normal ө High	ө Ephemeral ө Seep
ө Other _____	ө Very Rapid or Torrential	

Riparian Vegetation: Dom. Tree / Shrub Taxa	Canopy Cover:	Channel Alterations:
Dominate Type:	(ө Fully Exposed (0-25%))	ө Dredging
ө Trees ө Shrubs	ө Partially Shaded (25-50%)	(ө Channelization)
ө Grasses (ө Herbaceous)	ө Partially Exposed (50-75%)	(ө Full or ө Partial)
Number of Strata ____	ө Fully Shaded (75-100%)	

Substrate ө Est. ө P.C.	Riffle ____ %	Run ____ %	Pool ____ %
Silt / Clay (< 0.06 mm)			
Sand (0.06 - 2 mm)	5	5	5
Gravel (2 - 64 mm)	75	75	75
Cobble (64 - 256 mm)	20	20	20
Boulders (> 256 mm)			
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate / Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged lobs, undercut banks, cobble or other stable habitat and at stage to allow full colonication potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less then desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pool large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1

Notes and Comments:

4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently' pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including shrubs, or nonwoody macrophytes; vegeative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activites have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activity.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 (0)
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 (0)

TOTAL SCORE __88__

Attachment 13

Preliminary Jurisdictional Determination Form

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

BACKGROUND INFORMATION

A.   REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL DETERMINATION (JD): May 27, 2009

B.   NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:
Ms. Lee Carolan
Palmer Engineering Company, Inc.
P.O. Box 747
Winchester, KY 40492-0747

C.   DISTRICT OFFICE, FILE NAME, AND NUMBER: CELRL, Midway
Station, LRL-2009-372

D.   PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
(USE THE ATTACHED TABLE TO DOCUMENT MULTIPLE WATERBODIES AT DIFFERENT SITES)
State: KY   County/parish/borough: Clark County   City: Winchester
Center coordinates of site (lat/long in degree decimal format):
Lat. 37° 58' 37"N, Long. 84° 11' 51"W.
                              Universal Transverse Mercator: NAD83
Name of nearest waterbody: Lower Howards Creek

Identify (estimate) amount of waters in the review area:
    Non-wetland waters: total linear feet: 100.09(ft) acreage: 0.0147(ac).
    Cowardin Class: Riverine
    Stream Flow: Intermittent and Perennial
    Wetlands: 0.649 total acres, 0.0(ac) impacted.
    Cowardin Class: Riverine

Name of any water bodies on the site that have been identified as Section 10
waters: None identified
    Tidal:
    Non-Tidal:

E.   REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
    ☒ Office (Desk) Determination. Date:
    Field Determination. Date(s): 28 July, 2008 / 22 May, 2009

1. The Corps of Engineers believes that there may be jurisdictional waters of the
United States on the subject site, and the permit applicant or other affected party

1

who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable. This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

X Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant:Palmer Engineering, April 2009.

X Data sheets prepared/submitted by or on behalf of the applicant/consultant.

    ☒ Office concurs with data sheets/delineation report.

    ☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps: .

☐ Corps navigable waters' study: .

☐ U.S. Geological Survey Hydrologic Atlas: .

    ☒ USGS NHD data.

    ☐ USGS 8 and 12 digit HUC maps.

X U.S. Geological Survey map(s). Cite scale & quad name:

☒ USDA Natural Resources Conservation Service Soil Survey. Citation:

.

☒ National wetlands inventory map(s). Cite name: .

☒ State/Local wetland inventory map(s):   .

X FEMA/FIRM maps:2102300010A dated 6-1-1978

X 100-year Floodplain Elevation is:

X Photographs: Aerial (Name & Date):   .

    or X Other (Name & Date): February 24 & 25, 2009.

☐ Previous determination(s). File no. and date of response letter: .

X Other information (please specify): Site photographs.

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Signature and date of
Regulatory Project Manager
(REQUIRED)

Signature and date of
person requesting preliminary JD
(REQUIRED, unless obtaining
the signature is impracticable)

Site number	Latitude	Longitude	Cowardin Class	Estimated amount of aquatic resource in review area	Class of aquatic resource
S.C.-01	0746005	4206771	Perennial	7.72 ft (0.00114) ac	non-section 10 – non-wetland
S.C.-02	0746177	4207381	Perennial	6.99 ft (0.00044) ac	non-section 10 – non-wetland
S.C.-03	0746185	4207415	Perennial	6.00 ft (0.00077) ac	non-section 10 – non-wetland
S.C.-04	0746242	4207534	Intermittent	6.18 ft (0.00087) ac	non-section 10 – non-wetland
S.C.-05	0746262	4207606	Intermittent	7.14 ft (0.00104) ac	non-section 10 – non-wetland
S.C.-06	0746329	4207794	Intermittent	7.91 ft (0.00124) ac	non-section 10 – non-wetland
S.C.-07	0746348	4207916	Intermittent	6.22 ft (0.00086) ac	non-section 10 – non-wetland
S.C.-08	0746246	4206801	Perennial	5.30 ft (0.00161) ac	non-section 10 – non-wetland
S.C.-09	0746568	4206936	Intermittent	9.85 ft (0.00111) ac	non-section 10 – non-wetland
S.C.-10	0746568	4206936	Intermittent	5.18 ft (0.00033) ac	non-section 10 – non-wetland
S.C.-11	0746624	4206886	Intermittent	25.72 ft (0.00443) ac	non-section 10 – non-wetland
S.C.-12	0746624	4206886	Intermittent	5.88 ft (0.00088) ac	non-section 10 – non-wetland
Wetland 1	0746060	4206966	Riverine	0.476 acres	non-section 10 – wetland
Wetland 2	0746037	4207047	Riverine	0.173 acres	non-section 10 – wetland
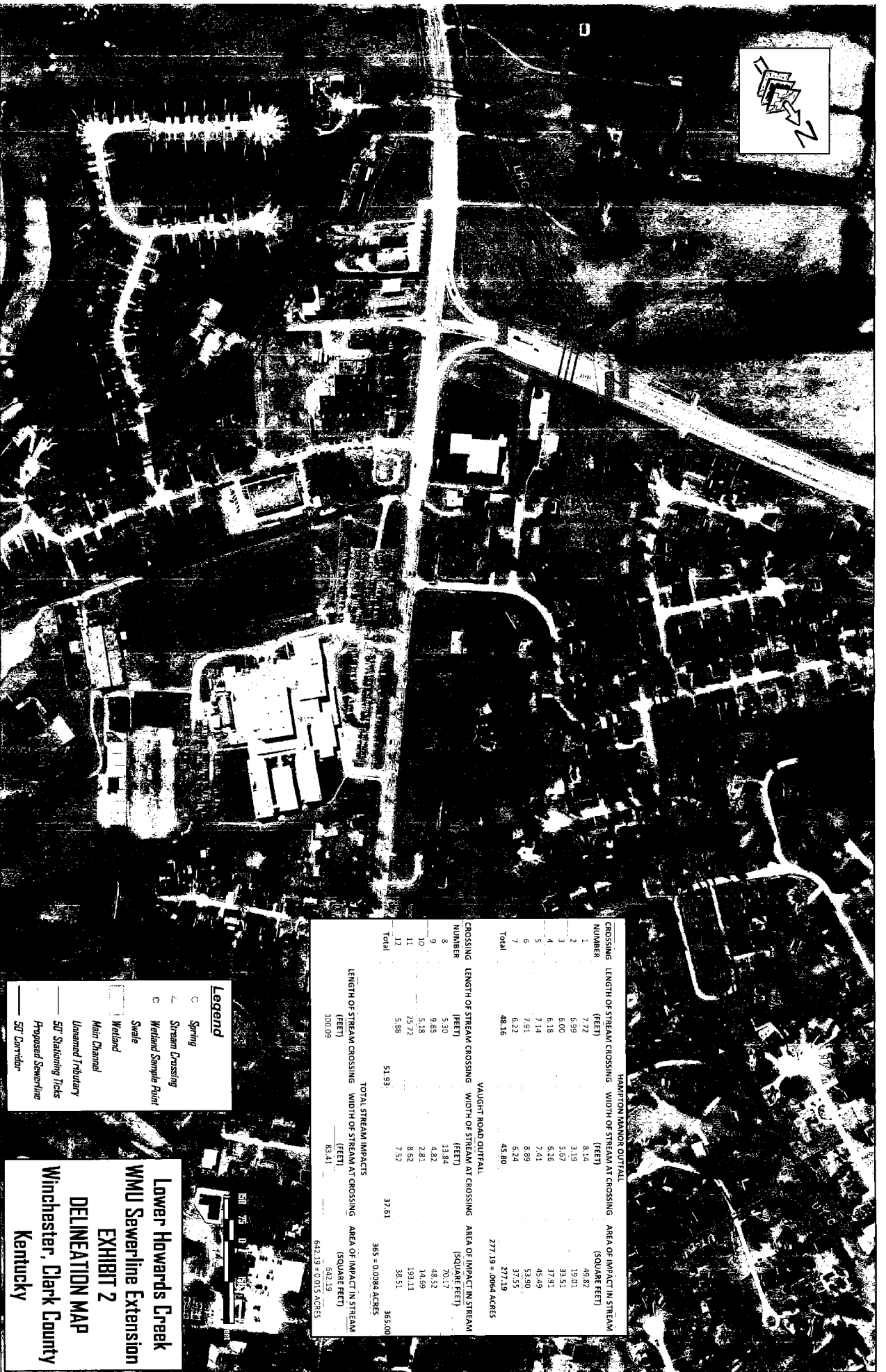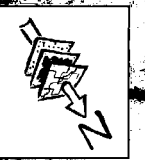
HAMPTON MANOR OUTFALL

CROSSING NUMBER	LENGTH OF STREAM CROSSING (FEET)	WIDTH OF STREAM AT CROSSING (FEET)	AREA OF IMPACT IN STREAM (SQUARE FEET)
1	7.72	8.14	49.82
2	6.99	3.19	19.01
3	6.00	5.67	33.51
4	6.18	6.26	37.91
5	7.14	7.41	45.49
6	7.91	8.89	53.90
7	6.22	6.24	37.55
Total	48.16	45.80	277.19

277.19 = .0064 ACRES

VAUGHT ROAD OUTFALL

CROSSING NUMBER	LENGTH OF STREAM CROSSING (FEET)	WIDTH OF STREAM AT CROSSING (FEET)	AREA OF IMPACT IN STREAM (SQUARE FEET)
8	5.30	13.84	70.17
9	9.85	4.82	48.52
10	5.18	2.81	14.99
11	25.72	8.52	193.11
12	5.88	7.52	38.51
Total	51.93	37.61	365.00

365 = 0.0084 ACRES

TOTAL STREAM IMPACTS

LENGTH OF STREAM CROSSING (FEET)	WIDTH OF STREAM AT CROSSING (FEET)	AREA OF IMPACT IN STREAM (SQUARE FEET)
100.09	83.41	642.19

642.19 = 0.015 ACRES

Legend

- ○ Spring
- ↙ Stream Crossing
- ⊙ Wetland Sample Point
- Wetland
- Swale
- —— Main Channel
- —— Unnamed Tributary
- —— 50' Stationing Ticks
- —— Proposed Sewerline
- —— 50' Corridor

Lower Howards Creek
WMU Sewerline Extension
EXHIBIT 2
DELINEATION MAP
Winchester, Clark County
Kentucky